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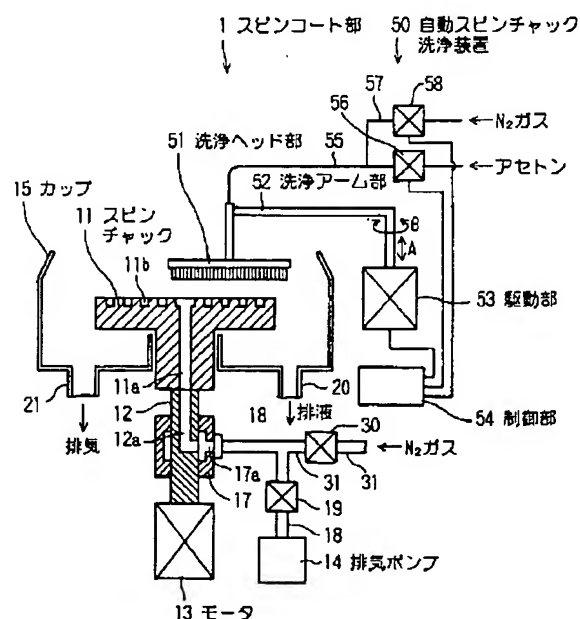
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(54) 【発明の名称】 レジスト塗布装置

(57) 【要約】

【課題】 半導体ウェハを真空吸着する基板ホルダの洗浄に伴う稼働率低下を抑制したレジスト塗布装置を提供する。

【解決手段】 レジスト塗布装置のスピンコート部1に、スピンチャック11を洗浄するブラシ51aと、アセトンおよびN₂ガスを噴出させる噴出口を有する洗浄ヘッド部51と、洗浄ヘッド部51に接続する洗浄アーム52と、洗浄アーム52を垂直方向および水平方向に移動させる駆動部53と、アセトンの噴出制御、N₂ガスの噴出制御および駆動部53の駆動制御をする制御部54とを有して構成される自動スピンチャック洗浄装置50を設ける。



【特許請求の範囲】

【請求項1】 半導体ウェハを真空吸着する基板ホルダを有するレジスト塗布装置において、前記基板ホルダを洗浄するブラシと、洗浄液および気体を噴出させる噴出口を有する洗浄ヘッド部と、前記洗浄ヘッド部に接続する洗浄アームと、前記洗浄アームを垂直方向および水平方向に移動させる駆動部と、前記洗浄液の噴出制御、前記気体の噴出制御および前記駆動部の駆動制御をする制御部とを有して構成される自動スピチャック洗浄装置を有することを特徴とするレジスト塗布装置。

【請求項2】 前記ブラシは、フッ素樹脂製繊維によるブラシであることを特徴とする、請求項1に記載のレジスト塗布装置。

【請求項3】 前記洗浄液は、アセトンであることを特徴とする、請求項1に記載のレジスト塗布装置。

【請求項4】 前記気体は、空気およびN₂ガスのうち、いずれか一方のガスであることを特徴とする、請求項1に記載のレジスト塗布装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明はレジスト塗布装置に関し、さらに詳しくは、スピコート部に、半導体ウェハを真空吸着させるスピチャックの自動洗浄機構を付加したレジスト塗布装置に関する。

【0002】

【従来の技術】半導体装置の製造工程で用いられるレジスト塗布装置は、半導体ウェハを基板ホルダ、所謂スピチャックに載置し、その後半導体ウェハを真空吸着（真空チャック）により吸着させた後、フォトレジストを滴下し、その後スピチャックを高速回転させ、遠心力でフォトレジストを広がらせ、半導体ウェハ上全面にフォトレジストを均一に塗布する、所謂スピコーティング法を用いて半導体ウェハ上にフォトレジストを塗布する。

【0003】一般のレジスト塗布装置は、露光装置と連結されて使用され、フォトレジスト塗布前の半導体ウェハは、半導体ウェハを多数収納したウェハキャリアが載置されるローディング部のウェハキャリアからウェハ搬送系により搬送されて、スピコート部に送られ、更にスピコート部よりフォトレジストのプレベーク部に送られ、その後プレベーク部より露光装置へと送られる構成となっている。このレジスト塗布装置におけるスピコート部の従来例を、図3および図4を参照して説明する。

【0004】レジスト塗布装置のスピコート部1は、図3に示すように、半導体ウェハ10を真空チャックし、モータ13により回転するスピチャック11と、スピチャック11と連結した回転軸12と、モータ1

3と、半導体ウェハ10を真空チャックするための排気ポンプ14と、スピチャック11外の周辺部に設置され、遠心力により飛散するフォトレジスト等を受けとるカップ15と、フォトレジストを半導体ウェハ10上に滴下する際、半導体ウェハ10の中央上方部に移動してくるフォトレジスト用ノズル16で概略構成されている。

【0005】スピチャック11の表面構造は、図4に示すように、円形の真空チャック溝部11bとこの真空チャック溝部11bと交叉する十字状の真空チャック溝部11cが設けられ、この十字状の真空チャック溝部11cの中央がスピチャック11中心部の排気孔11aに接続した構造となっている。半導体ウェハ10のスピチャック11への真空チャックは、排気管18の途中に設けられたバルブ19が開き、スピチャック11表面に設けられた真空チャック溝部11bに接続しているスピチャック11中心部の排気孔11a、回転軸12の排気孔12a、回転軸12の周囲に、回転軸12の回転を妨げないように取り付けられたバキュームチャック17の排気孔17aおよび排気管18を通した、排気ポンプ14の排気により行われる。

【0006】カップ15の底部には、飛散したフォトレジストを集めて排出する廃液配管20と、遠心力により飛散したフォトレジストで、半導体ウェハ10周辺の雰囲気（図示省略）に浮遊するレジストやリンス液の微粒子が半導体ウェハ10に再付着するのを防止するため、半導体ウェハ10周辺の雰囲気（図示省略）を下方に流す、排気系の排気管21とが取り付けられている。

【0007】半導体ウェハ10の上方にあるフォトレジスト用ノズル16は、フォトレジスト用の配管23を介して、フォトレジストの滴下量を制御するバルブ22に接続されており、配管23途中より分岐した場所には、フォトレジストを半導体ウェハ10上に滴下後、フォトレジスト用ノズル16先端のフォトレジストを供給側に引き戻し、半導体ウェハ10上へのフォトレジストのボタ落ちを防ぐためのサックバック部24が接続されている。

【0008】上記のレジスト塗布装置のスピコート部におけるフォトレジストの塗布動作は、まず半導体ウェハ10が、レジスト塗布装置の搬送系（図示省略）によって搬送され、スピチャック11上に載置される。次に、排気管18のバルブ19が開き、半導体ウェハ10がスピチャック11に真空チャックされる。その後、配管23に接続したフォトレジスト用ノズル16が、駆動部（図示省略）により水平方向に移動して、半導体ウェハ10の中央部上方に設置され、その後バルブ22が所定時間だけ開き、フォトレジスト用ノズル16先端より所定量のフォトレジストを半導体ウェハ10中央部に滴下する。フォトレジスト滴下後、自動的にサックバック部24が動作して、フォトレジスト用ノズル16先端

のフォトレジストを供給側に引き戻す。その後フォトレジスト用ノズル16は、駆動部(図示省略)により水平方向に移動して、半導体ウェハ10の中央部上方の位置より元の位置に戻る。

【0009】次に、モータ13によりスピチャック11が回転し、半導体ウェハ10上にほぼ均一な所定膜厚のフォトレジストを塗布した後、スピチャック11の回転が停止する。その後、排気管18のバルブ19が閉じ、半導体ウェハ10のスピチャック11による真空チャックが解除される。更にその後、フォトレジストが
10 塗布された半導体ウェハは、レジスト塗布装置の搬送系(図示省略)により、スピコート部1よりプレバーク部に搬送され、プレバーク後は、また搬送系により、露光装置へと送られる。

【0010】上述したスピコート部1のスピチャック11に半導体ウェハ10を真空チャックする際、スピチャック11表面にダストやフォトレジスト等が付着していると、半導体ウェハ10の真空チャックが不完全となり、スピチャック11が回転で半導体ウェハ10がスピチャック11から離脱して、半導体ウェハ10を破損させたり、カップ15に触れて半導体ウェハ10を汚染させたりする。また、ダストが固いものであると、半導体ウェハ10を真空チャックする際、半導体ウェハ10が割れてしまう虞もある。更に、スピチャック11表面に付着したフォトレジストが半導体ウェハ10裏面に転写される形で付着すると、ベルト搬送による搬送系が使用される場合に搬送ベルトにフォトレジストが付着して、搬送系の故障の原因となったり、レジスト塗布装置に接続された露光装置の搬送系等の故障の原因となったりする。また、スピチャック11表面からの
30 半導体ウェハ10裏面への汚染物は、後工程で半導体ウェハ10に拡散し、半導体装置の製造歩留を低下させるという問題もある。従来、上述した様な問題発生を抑制するため、スピチャック11をスピコート部1より取り外した後、スピチャック11を洗浄する方法が採られているために、レジスト塗布装置の稼働率低下という問題が発生する。

【0011】

【発明が解決しようとする課題】本発明は、上述した半導体製造装置における問題点を解決することをその目的とする。即ち本発明の課題は、半導体ウェハを真空チャックするスピチャックの洗浄に伴う稼働率低下を抑制したレジスト塗布装置を提供することを目的とする。

【0012】

【課題を解決するための手段】本発明のレジスト塗布装置は、上述の課題を解決するために提案するものであり、半導体ウェハを真空吸着する基板ホルダを有するレジスト塗布装置において、基板ホルダを洗浄するブラシと、洗浄液および気体を噴出させる噴出口を有する洗浄ヘッド部と、洗浄ヘッド部に接続する洗浄アームと、洗
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浄アームを垂直方向および水平方向に移動させる駆動部と、洗浄液の噴出制御、気体の噴出制御および駆動部の駆動制御をする制御部とを有して構成される自動スピチャック洗浄装置を有することを特徴とするものである。

【0013】本発明によれば、レジスト塗布装置のスピチャックを洗浄する、上述した自動スピチャック洗浄装置によるスピチャック洗浄が、自動的に行えるので、従来のようにスピチャックをスピコート部より取り外した後、スピチャックを洗浄する作業を行う必要がない。従ってレジスト塗布装置の稼働率が向上する。また、上述した自動スピチャック洗浄手段により、スピチャックの洗浄を定期的に行えば、スピチャック表面のダストやスピチャック表面に付着したフォトレジストによる真空チャックの不良に起因した、フォトレジスト塗布時の半導体ウェハ破損を軽減でき、また半導体ウェハ裏面へのスピチャック部でのダスト付着に起因する半導体装置の製造歩留の低下が軽減できる。

20 【0014】

【発明の実施の形態】以下、本発明の具体的実施の形態例につき、添付図面を参照して説明する。なお従来技術の説明で参照した図3および図4中の構成部分と同様の構成部分には、同一の参照符号を付すものとする。

【0015】本実施の形態例は、半導体ウェハを真空吸着する基板ホルダを有するレジスト塗布装置に本発明を適用した例であり、これを図1および図2を参照して説明する。ここで、図1はレジスト塗布装置のスピコート部1の概略図で、図2は、自動スピチャック洗浄装置50の洗浄ヘッド部51の概略図で、図2(a)は洗浄ヘッド部51の概略断面図、図2(b)は、洗浄ヘッド部51を下方より見た、概略平面図である。まず、レジスト塗布装置のスピコート部1の基本構成は、図1に示すように、従来例のレジスト塗布装置のスピコート部1とほぼ同様なので、同様な部分の説明は省略し、特徴部分の説明を詳述する。

【0016】スピチャック11上に載置させた半導体ウェハを真空チャックするための排気系は、スピチャック11の排気孔11aと、回転軸12の排気孔12aと、バキュームチャック17の排気孔17aと、排気管18と、バルブ19および排気ポンプ14にて構成されているが、この排気系の排気孔17aとバルブ19間の排気管18には、スピチャック11表面の洗浄時にスピチャック11の排気孔11aより上方に気体、例えばN₂ガスを放出させるための配管31が接続され、この配管31の途中にはバルブ30が設けられている。

【0017】スピチャック11を洗浄する自動スピチャック洗浄装置50は、洗浄ヘッド部51と、洗浄ヘッド部51に接続する洗浄アーム部52と、洗浄アーム部52を垂直方向および水平方向に回転移動させる駆動

部53と、洗浄液の噴出制御、気体の噴出制御および駆動部の駆動制御をする制御部54とで概略構成されている。洗浄ヘッド部51には、洗浄液供給部(図示省略)よりフォトレジスト等を溶解する洗浄液、例えばアセトンを送る、配管55が接続されており、この配管55の途中には、制御部54によって制御されるバルブ56が設けられている。また、洗浄ヘッド部51に気体、例えばN₂ ガスを送り込むための配管57が、洗浄ヘッド部51とバルブ56との間の配管55に接続する形で設けられ、この配管57の途中には、制御部54によって制

10 御されるバルブ58が設けられている。
 【0018】洗浄ヘッド部51は、図2(a)および図2(b)に示すように、スピチャック11の半径より少し大きい長辺を持つ、中空部を持つ直方体状の噴出部51bと、噴出部51bに取り付けられた洗浄用のフッ素樹脂製繊維によるブラシ、例えばテフロン製繊維によるブラシ51aと、洗浄液、又はN₂ ガスが送られてくる配管55と接続する配管部51cとで構成されている。直方体状の噴出部51bは、図2(b)に示すように、噴出部51bの洗浄用のブラシ51aが噴出部51bの長辺に沿って取り付けられていて、この洗浄用のブラ

20 シ51aに平行する形で、口径の小さな複数の噴出口51dが設けられている。なお、洗浄ヘッド部51の下方にあるスピチャック11の回転方向、例えば図2(b)に示す矢印Cの回転方向とした時、噴出部51bとブラシ51aとの位置関係は矢印C方向に噴出部51b、次にブラシ51aの順とする。

【0019】洗浄アーム52は、洗浄ヘッド部51を支持し、洗浄アーム52の駆動部53に接続して、駆動部53により、矢印Aに示すような垂直移動と矢印B

30 に示すような水平方向の回転移動をする。
 【0020】次に、本発明の実施の形態例のレジスト塗布装置における、スピコート部1の動作について説明する。まず、半導体ウェハへのフォトレジスト塗布前に、スピチャック11の洗浄を行う。この洗浄動作は、まずモータ13を回転させ、N₂ ガスの配管31に取り付けられたバルブ30を開けて、N₂ ガスをスピチャック11の排気孔11aよりスピチャック11表面の上方に放出させる。このN₂ ガスのスピチャック11表面上方への放出により、後述する洗浄ヘッド部51によるスピチャック11の洗浄時に、真空チャックの排気系である、排気口11a、12aや排気管18等にアセトン等の洗浄液の流入を防止する。

【0021】次に、制御部54によりスピチャック11の洗浄開始の指示を出す。洗浄開始の指示で、制御部54より駆動部53に信号が送られ、駆動部53が動作して、洗浄アーム52を水平方向に回転移動(矢印Bの移動)し、スピコート部1のカップ15の外側にあった洗浄ヘッド部51がスピチャック11の上方に移動し、その後洗浄アーム52が下方に移動(矢印Aの移

動)する。上記の洗浄アーム52の下方方向の移動が開始されると、洗浄ヘッド部51にアセトンを送り込む配管55のバルブ56を開くための信号が制御部54よりバルブ56に送られ、バルブ56が開いて、洗浄ヘッド部51の噴出口51dよりアセトンがスピチャック11表面に向かって噴出し始める。

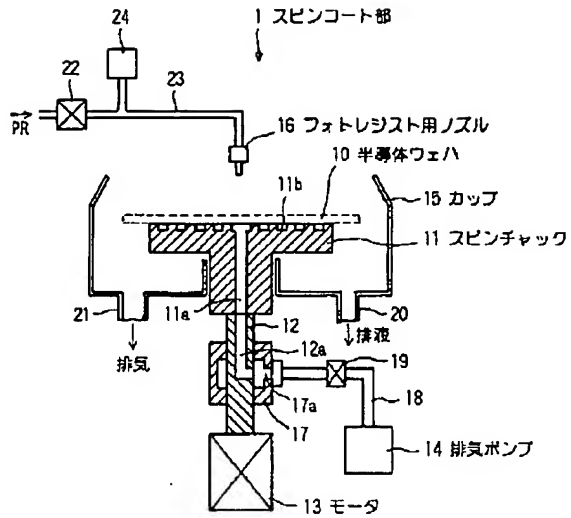
【0022】洗浄アーム52が下方方向に移動し、洗浄ヘッド部51のブラシ51aがスピチャック11に接する位置で、洗浄アーム52の下方方向への移動は停止する。この状態において、回転しているスピチャック11表面は、アセトン溶液とブラシ51aにより洗浄が行われる。アセトン溶液とブラシ51aによる所定時間の洗浄後、制御部54より信号が駆動部53に送られ、駆動部53が動作し、洗浄アーム52が上方方向に移動(矢印Aの移動)する。この洗浄アーム52の上方方向への移動が開始し、ブラシ51aがスピチャック11から離れると、制御部54よりバルブ56およびバルブ58に信号が送られ、バルブ56が閉じ、バルブ58が開き、洗浄ヘッド部51の噴出口51dよりN₂ を噴出させ、スピチャック11表面の洗浄液の乾燥およびダストの吹き飛ばしを行う。

【0023】洗浄アーム52が上方方向に移動し、所定の位置になった時点で、制御部54よりバルブ58に信号が送られ、バルブ58が閉じる。その後洗浄アーム52が水平方向に回転移動(矢印Bの移動)し、スピコート部1のカップ15の外側の洗浄アーム52の元の位置に戻る。その後、N₂ ガスの配管31に取り付けられたバルブ30を閉じ、モータ13の回転を停止させる。なお、上述したスピチャック11の洗浄プロセスにおいては、バルブ30の動作やモータ13の動作を制御部54からの信号指示で行わなかったが、バルブ30の動作やモータ13の動作も制御部54からの信号指示で動作する構成としてもよい。

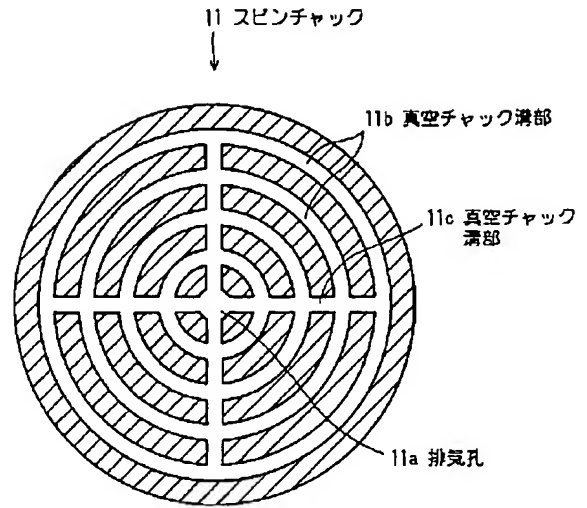
【0024】上述したスピチャック11の洗浄終了後に、従来例と同様にして、半導体ウェハをスピチャック11上に載置し、真空チャックを行い、フォトレジスト用ノズル(図3参照)を半導体ウェハの中央部上方に移動させ、フォトレジストを半導体ウェハ上に滴下し、スピチャック11を回転させてフォトレジストを塗布する。

40 【0025】上述した自動スピチャック洗浄装置50を設けたレジスト塗布装置によれば、フォトレジストを塗布しようとする所定数量の半導体ウェハ(単位ロット)毎にフォトレジストの塗布前にスピチャック11の洗浄を行う等の、定期的洗浄が容易となり、スピチャック表面のダストやスピチャック表面に付着したフォトレジストによる真空チャックの不良に起因した、フォトレジスト塗布時の半導体ウェハ破損を軽減でき、また半導体ウェハ裏面へのスピチャック部でのダスト付着に起因する半導体装置の製造歩留の低下が軽減でき

【図3】



【図4】



ERWENT-ACC-NO: 1999-031087

DERWENT-WEEK: 199903

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TITLE: Automatic substrate holder washing apparatus
for primary transfer unit used in semiconductor device
manufacture - has movable washing head with brush for
cleaning spin chuck using washing liquid and gas

PATENT-ASSIGNEE: SONY CORP[SONY]

PRIORITY-DATA: 1997JP-0101802 (April 18, 1997)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
PAGES MAIN-IPC		
JP 10294261 A	November 4, 1998	N/A
006 H01L 021/027		

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO
APPL-DATE		
JP 10294261A	N/A	1997JP-0101802
April 18, 1997		

INT-CL (IPC): B05C011/08, G03F007/16 , H01L021/027 , H01L021/304

ABSTRACTED-PUB-NO: JP 10294261A

BASIC-ABSTRACT:

The washing apparatus (50) has a washing head (51) for cleaning a spin chuck (11) of a spin coat device (1) in the primary transfer unit. The spin chuck holds a semiconductor wafer (10) by vacuum suction. The washing head is provided with brush which washes the spin chuck. A jet nozzle (51d) is provided in the head through which cleaning liquid and gas is sprayed. The ejection of the cleaning liquid and the gas is controlled by a controller (54). The head is positioned suitably using a washing arm (52) connected to

it. The
arm is moved in vertical or horizontal direction by a drive unit (53)
which is
operated by the controller.

USE - For coating photoresist on substrate.

ADVANTAGE - Prevents reduction in operation speed of spin coat
device. Enables
easy cleaning of spin chuck. Prevents damage to wafer due to defect
in spin
chuck.

CHOSEN-DRAWING: Dwg.1/4

TITLE-TERMS: AUTOMATIC SUBSTRATE HOLD WASHING APPARATUS PRIMARY
TRANSFER UNIT

SEMICONDUCTOR DEVICE MANUFACTURE MOVE WASHING HEAD BRUSH
CLEAN SPIN
CHUCK WASHING LIQUID GAS

DERWENT-CLASS: L03 P42 P84 U11

CPI-CODES: L04-C09; L04-D10;

EPI-CODES: U11-C04A1B; U11-C09F; U11-F02A2;

SECONDARY-ACC-NO:

CPI Secondary Accession Numbers: C1999-009783

Non-CPI Secondary Accession Numbers: N1999-024165

MENU	SEARCH	INDEX	DETAIL	JAPANESE
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1 / 1

PATENT ABSTRACTS OF JAPAN

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(71)Applicant : SONY CORP

(22)Date of filing : 18.04.1997

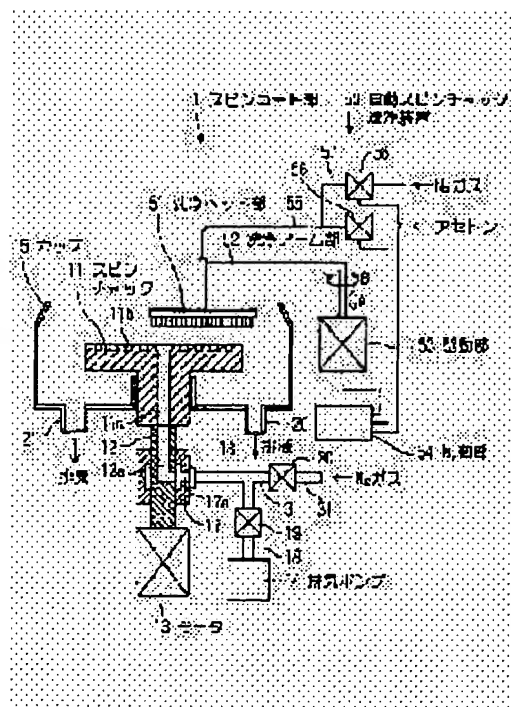
(72)Inventor : AKUNE SHUJI

(54) DEVICE FOR APPLYING RESIST

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a resist applying device suppressing the deterioration of a working rate with the cleaning of a substrate holder which vacuum-chucks a semiconductor wafer.

SOLUTION: In an automatic spin chuck cleaning device 50, the spin coating part 1 of the resist applying device is provided with a brush cleaning a spin chuck 11, a cleaning head part 51 having a jet port jetting acetone and N₂ gas, a cleaning arm 52 connected to the cleaning head part 51, a driving part 53 moving the cleaning arm 52 in a vertical direction and a horizontal direction and a control part 54 which controls the jetting of acetone, controls the jetting of N₂ gas and drives/controls the driving part 53.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than

the examiner's decision of rejection or
application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's
decision of rejection]

[Date of requesting appeal against examiner's
decision of rejection]

[Date of extinction of right]

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JAPANESE

[JP,10-294261,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE
INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

* NOTICES *

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] In the resist coater which has the substrate holder which carries out vacuum adsorption of the semi-conductor wafer The brush which washes said substrate holder, and the washing head section which has the exhaust nozzle which gushes a penetrant remover and a gas, The washing arm linked to said washing head section, and said washing arm With a perpendicular direction and the actuator which makes it move horizontally The resist coater characterized by having the automatic spin-chuck washing station constituted by having the control section which carries out blowout control of said penetrant remover, blowout control of said gas, and actuation control of said actuator.

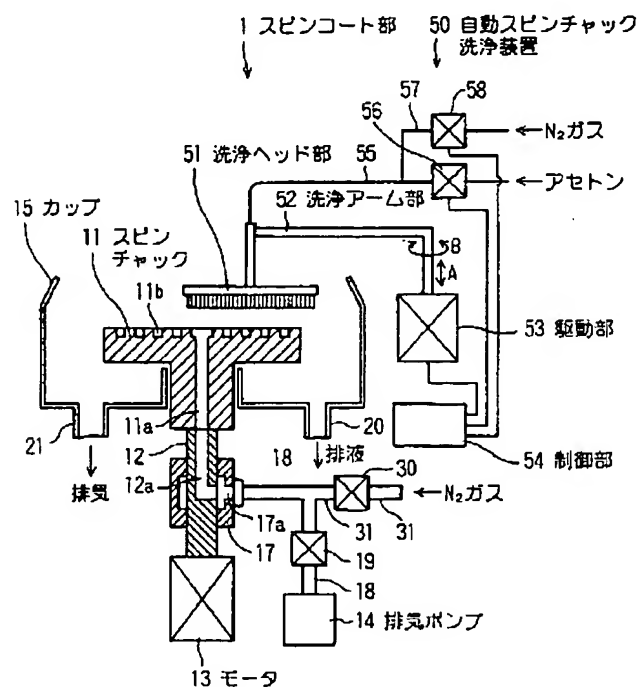
[Claim 2] Said brush is a resist coater according to claim 1 characterized by being a brush by the fiber made of a fluororesin.

[Claim 3] Said penetrant remover is a resist coater according to claim 1 characterized by being an acetone.

[Claim 4] Said gas is air and N2. Resist coater according to claim 1 characterized by being one of gas among gas.

[Translation done.]

Drawing selection [Representative drawing ▼]



[Translation done.]

JAPANESE

[JP,10-294261,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE
INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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- 3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the resist coater which added the automatic soaping-machine style of the spin chuck which carries out vacuum adsorption of the semi-conductor wafer to the spin coat section in more detail about a resist coater.

[0002]

[Description of the Prior Art] After the resist coater used by the production process of a semiconductor device laying a semi-conductor wafer in a substrate holder and the so-called spin chuck and making a semi-conductor wafer stick to it by vacuum adsorption (vacuum chuck) after that, it trickles a photoresist, carries out the high-speed revolution of the spin chuck after that, spreads a photoresist with a centrifugal force, and applies a photoresist on a semi-conductor wafer using the so-called spin coating method which applies a photoresist to homogeneity all over a semi-conductor wafer top.

[0003] A common resist coater is used for an aligner, connecting it, and the semi-conductor wafer before photoresist spreading has composition which is conveyed by the wafer conveyance system from the wafer carrier of the loading section with which the wafer carrier which contained many semi-conductor wafers is laid, is sent to the spin coat section, is further sent to the prebake section of a photoresist from the spin coat section, and is sent to an aligner from the prebake section after that. The conventional example of the spin coat section in this resist coater is explained with reference to drawing 3 and drawing 4.

[0004] The spin chuck 11 which the spin coat section 1 of a resist coater carries out the vacuum chuck of the semi-conductor wafer 10 as shown in drawing 3, and rotates by the motor 13, The revolving shaft 12 connected with the spin chuck 11, a motor 13, and the exhaust air pump 14 for carrying out the vacuum chuck of the semi-conductor wafer 10, It is installed in the periphery besides a spin chuck 11, and the cup 15 which receives the photoresist which disperses according to a centrifugal force, and in case a photoresist is dropped on the semi-conductor wafer 10, the outline configuration is carried out with the nozzle 16 for photoresists which moves to the central upper part section of the semi-conductor wafer 10.

[0005] As the surface structure of a spin chuck 11 is shown in drawing 4, vacuum-chuck slot 11c of the shape of a cross joint which intersects circular vacuum-chuck slot 11b and this vacuum-chuck slot 11b is prepared, and the center of vacuum-chuck slot 11c of the shape of this cross joint has structure linked to exhaust hole 11a of spin-chuck 11 core. The vacuum chuck to the spin chuck 11 of the semi-conductor wafer 10 is performed by exhaust air of the exhaust air pump 14 which let exhaust hole 17a of the vacuum chuck 17 and the exhaust pipe 18 which were attached in the perimeter of exhaust hole 11a of spin-chuck 11 core which the bulb 19 prepared in the middle of the exhaust pipe 18 has connected to vacuum-chuck slot 11b prepared in the aperture and spin-chuck 11 front face, exhaust hole 12a of a revolving shaft 12, and a revolving shaft 12 so that a revolution of a revolving shaft 12 might not be barred pass.

[0006] In order to prevent that the particle of the resist which floats in the ambient atmosphere of the

semi-conductor wafer 10 circumference, or a rinse carries out the reattachment to the semi-conductor wafer 10 by the waste fluid piping 20 which brings the photoresist which dispersed together in the pars basilaris ossis occipitalis of a cup 15, and is discharged, and the photoresist which dispersed according to the centrifugal force, the exhaust pipe 21 of the exhaust air system which passes caudad the ambient atmosphere of the semi-conductor wafer 10 circumference is attached.

[0007] The nozzle 16 for photoresists which is above the semi-conductor wafer 10 is connected to the bulb 22 which controls the drip of a photoresist through the piping 23 for photoresists, it pulls back after dropping a photoresist on the semi-conductor wafer 10 in the location which branched from the piping 23 middle at a photoresist at nozzle 16 head for photoresists supply-side, and the suck back section 24 for preventing the Botha omission of the photoresist to the semi-conductor wafer 10 top is connected.

[0008] First, the semi-conductor wafer 10 is conveyed by the conveyance system (graphic display abbreviation) of a resist coater, and spreading actuation of the photoresist in the spin coat section of the above-mentioned resist coater is laid on a spin chuck 11. Next, the vacuum chuck of an aperture and the semi-conductor wafer 10 is carried out for the bulb 19 of an exhaust pipe 18 to a spin chuck 11. Then, the nozzle 16 for photoresists linked to piping 23 moves horizontally by the actuator (graphic display abbreviation), and is installed in the center-section upper part of the semi-conductor wafer 10, and a bulb 22 trickles the photoresist of the specified quantity into semi-conductor wafer 10 center section only for predetermined time from an aperture and nozzle 16 head for photoresists after that. After photoresist dropping, the suck back section 24 operates automatically and the photoresist at nozzle 16 head for photoresists is pulled back to a supply side. After that, the nozzle 16 for photoresists moves horizontally by the actuator (graphic display abbreviation), and returns from the location of the center-section upper part of the semi-conductor wafer 10 to the original location.

[0009] Next, after a spin's chuck 11 rotating by the motor 13 and applying the photoresist of almost uniform predetermined thickness on the semi-conductor wafer 10, the revolution of a spin chuck 11 stops. Then, the vacuum chuck according [the bulb 19 of an exhaust pipe 18] to the spin chuck 11 of closing and the semi-conductor wafer 10 is canceled. Furthermore, after that, the semi-conductor wafer with which the photoresist was applied is conveyed by the conveyance system (graphic display abbreviation) of a resist coater from the spin coat section 1 at the prebake section, and after prebake is sent to an aligner by the conveyance system again.

[0010] If dust, a photoresist, etc. have adhered to spin-chuck 11 front face in case the vacuum chuck of the semi-conductor wafer 10 is carried out to the spin chuck 11 of the spin coat section 1 mentioned above, the semi-conductor wafer 10 secedes from a spin chuck 11 by revolution, and a spin chuck 11 touches a cup 15 and makes the semi-conductor wafer 10 for the vacuum chuck of the semi-conductor wafer 10 to become imperfect, and to damage the semi-conductor wafer 10 or pollute. Moreover, in case the vacuum chuck of the semi-conductor wafer 10 is carried out to dust being hard, there is also a possibility that the semi-conductor wafer 10 may break. Furthermore, if it adheres in the form where the photoresist adhering to spin-chuck 11 front face is imprinted by semi-conductor wafer 10 rear face, when the conveyance system by belt conveyance is used, a photoresist adheres to a conveyance belt, and it will become the cause of failure of a conveyance system, or will become the cause of failures, such as a conveyance system of the aligner connected to the resist coater. Moreover, the contamination to semi-conductor wafer 10 rear face from spin-chuck 11 front face is diffused to the semi-conductor wafer 10 at an after process, and also has the problem of reducing the manufacture yield of a semiconductor device. Since the approach of washing a spin chuck 11 is taken after removing a spin chuck 11 from the spin coat section 1, in order to control conventionally problem generating which was mentioned above, the problem of operating ratio lowering of a resist coater occurs.

[0011]

[Problem(s) to be Solved by the Invention] This invention sets it as the object to solve the trouble in the semiconductor fabrication machines and equipment mentioned above. Namely, the technical problem of this invention aims at offering the resist coater which controlled the operating ratio lowering accompanying washing of the spin chuck which carries out the vacuum chuck of the semi-conductor wafer.

[0012]

[Means for Solving the Problem] In the resist coater which has the substrate holder which proposes the resist coater of this invention in order to solve an above-mentioned technical problem, and carries out vacuum adsorption of the semi-conductor wafer The brush which washes a substrate holder, and the washing head section which has the exhaust nozzle which gushes a penetrant remover and a gas, It is characterized by having the automatic spin-chuck washing station constituted by having a washing arm linked to the washing head section, and the control section which carries out a perpendicular direction and the actuator which makes ~~it move horizontally~~, blowout control of a penetrant remover, gaseous blowout control, and actuation control of an actuator for a washing arm.

[0013] Since spin-chuck washing by the automatic spin-chuck washing station mentioned above which washes the spin chuck of a resist coater can be performed automatically according to this invention, after removing a spin chuck from the spin coat section like before, it is not necessary to do the activity which washes a spin chuck. Therefore, the operating ratio of a resist coater improves. Moreover, lowering of the manufacture yield of the semiconductor device which can mitigate the semi-conductor wafer breakage at the time of photoresist spreading which originated in the defect of the vacuum chuck by the photoresist adhering to the dust on the front face of a spin chuck or a spin-chuck front face when washing the spin chuck periodically, and originates in dust adhesion in the spin-chuck section to a semi-conductor wafer side with the automatic spin-chuck washing means mentioned above is mitigable.

[0014]

[Embodiment of the Invention] Hereafter, with reference to an accompanying drawing, it explains about the example of a gestalt of concrete operation of this invention. In addition, the same reference mark shall be given to the component in drawing 3 referred to by explanation of the conventional technique, and drawing 4 , and the same component.

[0015] The example of a gestalt of this operation is an example which applied this invention to the resist coater which has the substrate holder which carries out vacuum adsorption of the semi-conductor wafer, and explains this with reference to drawing 1 and drawing 2 . Drawing 1 is the schematic diagram of the spin coat section 1 of a resist coater, drawing 2 is the schematic diagram of the washing head section 51 of the automatic spin-chuck washing station 50 here, and it is the outline top view which drawing 2 (a) looked at the washing head section 51 from the outline sectional view of the washing head section 51, and looked at drawing 2 (b) from the lower part. First, since the basic configuration of the spin coat section 1 of a resist coater is the same as that of the spin coat section 1 of the resist coater of the conventional example almost as shown in drawing 1 , explanation of the same part is omitted and explains explanation of the description part in full detail.

[0016] The exhaust air system for carrying out the vacuum chuck of the semi-conductor wafer made to lay on a spin chuck 11 Although it consists of exhaust hole 11a of a spin chuck 11, exhaust hole 12a of a revolving shaft 12, exhaust hole 17a of the vacuum chuck 17, an exhaust pipe 18, and a bulb 19 and the exhaust air pump 14 In exhaust hole 17a of this exhaust air system, and the exhaust pipe 18 between bulbs 19, it is a gas, N₂ [for example,], from exhaust hole 11a of a spin chuck 11 to the upper part at the time of washing of spin-chuck 11 front face. The piping 31 for making gas emit is connected, and the bulb 30 is formed while being this piping 31.

[0017] The outline configuration of the automatic spin-chuck washing station 50 which washes a spin chuck 11 is carried out by the perpendicular direction and the actuator 53 which makes it rotate horizontally, and the control section 54 which carries out blowout control of a penetrant remover, gaseous blowout control, and actuation control of an actuator in the washing head section 51, the washing arm section 52 linked to the washing head section 51, and the washing arm section 52. The piping 55 which sends the penetrant remover which dissolves a photoresist etc., for example, an acetone, is connected to the washing head section 51 from the penetrant remover feed zone (graphic display abbreviation), and while being this piping 55, the bulb 56 controlled by the control section 54 is formed. Moreover, it is a gas, N₂ [for example,], to the washing head section 51. The piping 57 for sending in gas is formed in the form linked to the piping 55 between the washing head section 51 and a bulb 56, and the bulb 58 controlled by the control section 54 is formed in the middle of this piping 57.

[0018] As shown in drawing 2 (a) and drawing 2 R> 2 (b), the washing head section 51 Blowout section 51b of the shape of a rectangular parallelepiped with a centrum with a somewhat larger long side than the radius of a spin chuck 11, The brush by the fiber made of a fluoro resin for washing attached in blowout section 51b, for example, brush 51b by fiber made from Teflon a, and a penetrant remover or N2 It consists of piping 55 to which gas is sent, and piping section 51c to connect. As rectangular parallelepiped-like blowout section 51b is shown in drawing 2 (b), brush 51a for washing of blowout section 51b is attached along the long side of blowout section 51b, it is the form of being parallel to brush 51a for this washing, and 51d of two or more exhaust nozzles where aperture is small is prepared. In addition, when it carries out to the hand of cut of the spin chuck 11 which has the washing head section 51 caudad, for example, the hand of cut of the arrow head C shown in drawing 2 (b), physical relationship of blowout section 51b and brush 51a is made to blowout section 51b in the direction of arrow-head C, and then makes it the order of brush 51a.

[0019] The washing head section 51 was supported, it has connected with the actuator 53 of the washing arm 52, and the washing arm 52 carries out a horizontal rotation as shown in vertical migration as shown in an arrow head A, and an arrow head B by the actuator 53.

[0020] Next, actuation of the spin coat section 1 in the resist coater of the example of a gestalt of operation of this invention is explained. First, before photoresist spreading to a semi-conductor wafer, a spin chuck 11 is washed. A motor 13 is rotated first and this washing actuation is N2. The bulb 30 attached in the piping 31 of gas is opened, and it is N2. Gas is made to emit above [a / of a spin chuck 11 / exhaust hole 11] spin-chuck 11 front face. These N2 By bleedoff to the spin-chuck of gas 11 surface upper part, the inflow of penetrant removers, such as an acetone, is prevented in the exhaust ports 11a and 12a and exhaust pipe 18 grade which are the exhaust air system of a vacuum chuck at the time of washing of the spin chuck 11 by the washing head section 51 mentioned later.

[0021] Next, directions of washing initiation of a spin chuck 11 are issued by the control section 54. With directions of washing initiation, a signal is sent to an actuator 53 from a control section 54, an actuator 53 operates, the washing arm 52 is rotated horizontally (migration of an arrow head B), the washing head section 51 which was in the outside of the cup 15 of the spin coat section 1 moves above a spin chuck 11, and the washing arm 52 moves downward after that (migration of an arrow head A). If down migration of the above-mentioned washing arm 52 is started, the signal for opening the bulb 56 of the piping 55 which sends an acetone into the washing head section 51 will be sent to a bulb 56 from a control section 54, a bulb 56 will open, and an acetone will begin to spout toward spin-chuck 11 front face from 51d of exhaust nozzles of the washing head section 51.

[0022] The washing arm 52 moves downward and the migration to down [of the washing arm 52] stops in the location where brush 51a of the washing head section 51 touches a spin chuck 11. As for spin-chuck 11 revolving front face, washing is performed by an acetone solution and brush 51a in this condition. A signal is sent to an actuator 53 from a control section 54 after washing of the predetermined time by the acetone solution and brush 51a, an actuator 53 operates, and the washing arm 52 moves upward (migration of an arrow head A). When migration to above [of this washing arm 52] begins and brush 51a separates from a spin chuck 11, a signal is sent to a bulb 56 and a bulb 58 from a control section 54, a bulb 56 is closing and a bulb 58 is N2 in 51d of exhaust nozzles of an aperture and the washing head section 51. It is made to spout, desiccation of the penetrant remover of spin-chuck 11 front face and dust blow, and ***** is performed.

[0023] When the washing arm 52 moves upward and becomes a position, a signal is sent to a bulb 58 from a control section 54, and a bulb 58 closes. After that, the washing arm 52 rotates horizontally (migration of an arrow head B), and returns to the original location of the washing arm 52 of the outside of the cup 15 of the spin coat section 1. Then, N2 A revolution of closing and a motor 13 is stopped for the bulb 30 attached in the piping 31 of gas. In addition, in the washing process of a spin chuck 11 mentioned above, although the signal directions from a control section 54 performed neither actuation of a bulb 30, nor actuation of a motor 13, actuation of a bulb 30 and actuation of a motor 13 are also good also as a configuration which operates with the signal directions from a control section 54.

[0024] After washing termination of the spin chuck 11 mentioned above, like the conventional example,

a semi-conductor wafer is laid on a spin chuck 11, a vacuum chuck is performed, the nozzle for photoresists (refer to drawing 3) is moved to the center-section upper part of a semi-conductor wafer, a photoresist is dropped on a semi-conductor wafer, a spin chuck 11 is rotated, and a photoresist is applied.

[0025] According to the resist coater which formed the automatic spin-chuck washing station 50 mentioned above A spin chuck 11 is washed before spreading of a photoresist to every [of the amount of predetermined numbers which is going to apply a photoresist] semi-conductor wafer (unit lot), Routine cleaning became easy and originated in the defect of the vacuum chuck by the photoresist adhering to the dust on the front face of a spin chuck, or a spin-chuck front face. Lowering of the manufacture yield of the semiconductor device which can mitigate the semi-conductor wafer breakage at the time of photoresist spreading, and originates in dust adhesion in the spin-chuck section to a semi-conductor wafer side is mitigable. Moreover, after the resist coater mentioned above removes a spin chuck 11 from the spin coat section 1 like before, its operating ratio of a resist coater improves compared with what carries out washing of a spin chuck 11.

[0026] As mentioned above, although the example of a gestalt of operation explained this invention, this invention is not limited to the example of a gestalt of this operation at all. For example, although the brush attached in the washing head section was used as the brush by the fiber made from Teflon in the example of a gestalt of operation of this invention, the brush according to the fiber made of resin, such as nylon, depending on the penetrant remover to be used may be used. Moreover, although the example of a gestalt of operation of this invention used and explained the acetone to the penetrant remover, it is good also considering the solvent of photoresists, such as thinner, as a penetrant remover. In addition, the operations sequence of the automatic spin-chuck washing station in washing of a spin chuck can be suitably changed within the limits of the technical thought of this invention.

[0027]

[Effect of the Invention] The resist coater which formed the automatic spin-chuck washing station of this invention can control the operating ratio lowering accompanying washing of the spin chuck which carries out the vacuum chuck of the semi-conductor wafer so that clearly from the above explanation. Moreover, if the resist coater of this invention is used for manufacture of a semiconductor device, lowering of the manufacture yield of the semiconductor device which the routine cleaning of a spin chuck becomes easy, and breakage of the semi-conductor wafer by the defect of a vacuum chuck is mitigated, and originates in dust adhesion in the spin-chuck section to a semi-conductor wafer side is mitigable.

[Translation done.]